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NUMBER III

Reports of Investigations by Members of The Society of College Teachers of Education

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PAPERS BY
G. D. STRAYER, E. E. JONES, E. E. RALL, J. L. MERIAM
C. H. JUDD, H. H. HORNE

PAPERS PRESENTED FOR DISCUSSION AT THE MEETING OF THE SOCIETY OF COLLEGE TEACHERS OF EDUCATION, PHILADELPHIA
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PSYCHOLOGICAL CHARACTERISTICS OF THE INTERMEDIATE GRADES

CHARLES H. JUDD
University of Chicago

The following paper is intended to serve two distinct purposes. It aims first to deal through the medium of scientific principles with a series of difficult school problems. Secondly, it aims to illustrate the possibility of a type of educational psychology which has never been worked out as fully as it might be on the basis of facts now at hand. The psychology of the different grades would supplement the psychology which we now have dealing with the different subjects of instruction. Thus in addition to the psychology of reading, writing, and drawing, the present paper aims to present a study of the general mental characteristics which appear in all of these subjects at one point or cross-section.

The facts on which this paper is based are derived from a number of recent papers dealing with various phases of education. We may take up first the facts regarding promotion. In a paper published in the *Elementary School Teacher* of October, 1911 (XII, 60–70), Mr. Mirick shows that failures to secure promotion in the Indianapolis schools were at the beginning of the period under investigation, most pronounced in the fourth grade, first division. In the primary grades below the fourth and in all the grades above the fourth, promotion was more frequent than just at this middle point in the school. Like facts appear in an unpublished report made by the Superintendent of Schools in Michigan City. The table of percentages of failure in the grades is as follows:

Grade	I		II		III		IV	
Division	1	2	1	2	1	2	1	2
Percentage	15.98	7.80	9.64	5.45	6.56	7.40	9.35	9.41
Grade	V		VI		VII		VIII	
Division	1	2	1	2	1	2	1	2
Percentage	12.01	6.37	7.47	3.25	9.51	5.04	15.29	6.28

This table draws attention to the first and eighth grades and the middle of the school. So pronounced is the difference between the fourth and fifth grades and the other grades immediately preceding and following that an explanation is required. Explanation is also called for in connection with the exceptional results for the first and eighth grades, but for the purposes of this study attention is concentrated on the middle of the school.

The explanation offered in the Michigan report is as follows: "The rise in the fourth grade is due in part to increased 'thought' reading as opposed to oral reading; the increase in arithmetic work; the taking up of heavier geography work; more definite requirements in written language. A local rise in the lower fifth grade may be expected from the fact that German is taken up at this point." Mr. Mirick in his report mentions several causes including the following: "Among the causes of retardation 'mathematics' was very prominent, with attention called to 'lack of reasoning power.'" "Another prominent cause of retardation was 'oral reading'" (p. 63). It was discovered that "a particularly high standard was held in mind at certain grades because of the assumed special difficulties or hazards to be met in the next grade. This is conspicuously true in grade 4B and 7B."

These quotations make it clear that there is a problem of the greatest interest in the immediate neighborhood of the fourth grade. Teachers expect a new attitude and set up new standards. What is the explanation of this special difficulty in the middle of the elementary school? Before seeking an explanation let us turn to some of the detailed studies of special subjects. Superintendent G. M. Wilson reports in the *Elementary School Teacher* for June, 1911 (XI, 540–53), some investigations on the rate and quality of writing. His results are of interest because writing did not play any part in the discussions to which reference has been made up to this point, and yet the fourth grade is distinguished in Mr. Wilson's table of speed as a point of transition. A part of this table may be quoted:

2A	3B	3A	4B	4A	5B	5A	6B	6A
14	20	36	48	60	51	52	71	60

It will be noted in this table that the fourth grade shows a sudden and exceptional rate. Dr. Freeman has collected unpublished evidence which shows that this observation based on Superintendent Wilson's table can be generalized. Indeed, in an article published in the *Elementary School Teacher* for September, 1912, Dr. Freeman publishes (p. 32) a table which shows that a very sudden change in speed takes place between the first half of the third grade and the first half of the fifth. Up to this point writing cannot be made rapid no matter what method of instruction is employed. During this intermediate period writing becomes rapid without reference to the method of instruction.

The coincidence of the two lines of evidence thus far presented is very striking because the types of mental and physical characteristics involved are very different. That reading and writing and general ability to reason and ability in arithmetic should all reach some kind of a crisis in the fourth and neighboring grades is a fact not to be overlooked in considering the psychology of elementary instruction.

Another independent line of evidence may be added to the facts already detailed. In the *Elementary School Teacher* for December, 1909 (X, 195), Mr. Courtis has reported in the account given of his arithmetic tests one very striking fact. The tests of reasoning shows a radical and impressive difference between the fourth graders and the fifth graders. The fourth graders reason slowly and cautiously. They are a little better than the third graders, but like the third graders in type. The fifth graders differ most radically from the fourth graders. The fifth graders are bold. They attempt anything in the way of reasoning. In conspicuous degree they fail to make good in their attempts, but they try without reserve and thus exhibit a mental attitude wholly different from that characteristic of the lower grades. That this radical change in attitude should appear at the point on which our attention has already been concentrated is very striking.

One further line of evidence may be adduced to draw attention to these intermediate grades as a period of special psychological interest. Children's ability and desire to draw passes through a definite cycle of development and decline. Little children draw

with perfect freedom. There is no technical ability manifest in their efforts, but there is interest and there is a freedom from restraint which seems to promise well for later life. At about the end of the third grade, the desire to draw suffers a total eclipse, there is a critical self-consciousness which appears, and a complete withdrawal of devotion from art. The compulsory exercises of the school become stiff and formal and the early promise of success in drawing gives place to despair on the part of both teacher and pupil. Drawing teachers are familiar with this deterioration. Indeed it may be pointed out that in other subjects also deterioration is not infrequently noted. The result is that the whole corps faces with stoical resignation the general fact pointed out at the beginning of this paper, where it was shown that children are more commonly held back in the fourth grade than elsewhere in their elementary course.

To the student of educational psychology the array of facts presented above constitutes a challenge for the exercise of scientific explanation. It may be most appropriate to characterize the remainder of this paper as a kind of psychological hypothesis. The description of the mental traits of the intermediate grade pupil which is offered in the effort to comprehend in a single formula all that has been presented in the early paragraphs of this paper will need to be critically examined and modified if necessary in the light of further tests, but the hypothesis or formula to be offered has one virtue which may be boldly asserted in its favor. Most schools do not regard the intermediate grades as of distinctive importance in the educational scheme. These grades have been vaguely described as periods for drill, which they most surely are not. They have been the final points to which inefficient teachers have been transferred. In short, they have suffered from lack of definition. If the formula offered is not adequate, it may at least have the virtue of stimulating critical investigation which will give a more adequate formula.

The ordinary child who has reached the fourth grade has had a long and arduous training in oral reading. He has now mastered the art of reading enough to use it independently. The result is that he begins to read more rapidly than during the primary grades,

and consequently he stumbles in his oral reading. He becomes interested in the subject-matter and because his vocal chords react slowly he lets his eyes run on along the following lines and does not supervise the vocal chord reactions fully. Speed in reading thus becomes an enemy of formal excellence in reading. Exactly the same description is appropriate in regard to penmanship. Speed is a symptom of mastery. The primary years have been given over to drill until now the forms of the letters are mastered and the child strikes out boldly to write. The excellence in form may suffer but efficiency in use requires at this stage a breaking away from the petty formal drill of the primary grades.

The feeling of independent power which the child exhibits in reading and writing gives him a new attitude toward the world. He is no longer docile and timid as he was in the primary grades. He begins to note the standards and demands of an objective world with which he can begin to wrestle. He begins to have standards and begins to respect them. The result is that he discovers that his primary methods of drawing are wholly childish. He even goes so far as to give up drawing because he sees his lack of excellence in the art. He begins, on the other hand, to essay new feats of reasoning in his arithmetic and in his dealings with the affairs of life. Perhaps he does not succeed very well at first, but he is impelled to try. What discourages him in drawing is that he cannot reach his own standards. In other spheres of effort the standards are perhaps less easily discovered and effort is longer continued.

In short, the intermediate grades are a curious mixture of bold efforts and discouraging failures. The boy starts to read and write rapidly, to reason boldly in arithmetic, and he is held up by standards which are so rigid that he fails of promotion. The practical result is that there is an enormous migration from our schools at this part of the course.

Should there not be a radical reform in the attitude of the schools toward this period of school work? Psychologically the applications of reading as distinguished from the first efforts to acquire the art call for training which is just as careful as that which is given earlier in the primary grades, but training in applications is a

new problem requiring methods of its own. The cultivation of speed in writing is a problem requiring methods of its own and is quite as significant as the cultivation of legibility. The cultivation of standards of drawing without destroying enthusiasm for drawing is as worthy as any type of training that can be undertaken. The failure of children in the intermediate grades is a failure on the part of teachers to recognize the special character of the school problem which presents itself at this point in the school. In confirmation of this last statement reference may be made again to the experience of the school system of Indianapolis. After discovering the excessive retardation in the fourth grade the Indianapolis system was able to reduce retardation promptly and noticeably. Furthermore, in one bold experiment a whole group of children who were supposed to be failing at this point were given a trial promotion with the result that they carried the work of the higher grade successfully. In other words, the Indianapolis school officers found that failure to promote was not the equitable method of dealing with the children of the fourth grade.

One further general comment may be offered in closing. This study suggests a broad general psychological and pedagogical principle, namely, the principle that there are nodes or crucial turning-points in mental development. The primary grades have a distinct function of their own, the upper grades should undoubtedly be recognized as characterized by distinct problems. Education is not a monotonous process. There are abrupt transitions calling for the closest psychological study and insight.

THE ABILITIES OF SPECIAL GROUPS OF HIGH-SCHOOL STUDENTS IN THE SUBJECTS WHICH THEY STUDIED[1]

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The tables and explanations which follow are abstracts of papers presented in a graduate course in education in Teachers College, Columbia University, during the past academic year. The first of these investigations was carried on by Mr. A. I. Dotey for the purpose of determining the place in scholarship held by the students electing Latin, German, and French. The investigation does not, of course, determine which language produces the best pupils, but rather which language is chosen by the best pupils in the school investigated. The data used were the term grades received on prepared work by pupils who had attended high school only one term at the time the grades were given. Five periods per week in English, in mathematics, and in biology were required of all pupils. One of the groups had five periods per week in Latin, one five periods per week in German, and one five periods per week in French. Two sets of grades were used. Group one had 708 pupils for the term February, 1911, to June, 1911, distributed in the following manner: Latin, 271; German, 222; French, 215. Group two had 689 pupils for the term September, 1911, to February, 1912, distributed in the following manner: Latin, 265; German, 222; French, 202. The method of investigation is briefly as follows:

The foreign-language sections are compared with one another:

1. As to scholarship, especially in the subjects other than the foreign language.

2. As to percentage of pupils in each section who, in the foreign

[1] Based on investigations by the writer's students, Messrs. A. I. Dotey, Nathan Silberstein, and David E. Weglein.

language, are above the median of that section in the other three subjects.

3. As to percentage of passing grades—passing grade is 60 per cent or above.

4. As to degree of correlation existing between grades in the foreign language and those in each of the three other subjects.

5. As to variability.

TABLE I

COMPARISON OF MEDIANS

	English	Mathematics	Biology	Three	Languages	Four
Group 1—						
Latin Section	69.51	65.18	65.37	67.56	65.33	66.79
German Section	64.33	60.47	63.16	63.21	60.21	62.46
French Section	65.15	64.54	62.08	64.51	59.89	62.12
Group 2—						
Latin Section	69.76	64.88	69.75	68.18	67.95	68.13
German Section	65.44	64.81	65.28	65.19	62.83	64.90
French Section	69.62	63.10	60.43	64.98	63.25	64.78
*Combined**—						
Latin Section	69.63	64.00	67.88	67.91	67.10	67.77
German Section	64.77	62.83	64.78	64.69	60.45	64.51
French Section	67.59	63.80	61.71	64.76	60.32	63.50

NOTE.—Figures in column headed "Three" were found by taking the grades recorded in English, Biology, and Mathematics in each section and finding their median *as grades* regardless of subject, or of the pupil who made them. The same process was employed to obtain figures in column headed "Four," which includes the grades obtained in the languages.

* Wherever the word "Combined" occurs it means that the grades in Groups 1 and 2 were thrown together and treated as one group.

TABLE II

PERCENTAGE OF EACH GROUP ABOVE MEDIAN OF EACH GROUP

	Latin Section	German Section	French Section
Group 1—	per cent	per cent	per cent
67.56 Latin median attained by	50.0	36.0	41.0
63.21 German median attained by	64.0	50.0	52.0
64.51 French median attained by	63.0	47.0	50.0
Group 2—			
68.18 Latin median attained by	50.0	42.5	42.4
65.19 German median attained by	57.6	50.0	48.3
64.98 French median attained by	57.9	52.0	50.0
Combined—			
67.91 Latin median attained by	50.0	39.0	41.0
64.69 German median attained by	59.−	50.0	50.+
64.76 French median attained by	58.+	49.+	50.0

NOTE.—Line one reads, e.g., Latin median of 67.56 in the three subjects other than Latin is attained by 36 per cent of the German section and 41 per cent of the French section in the same three subjects.

Line two reads, e.g., German median at 63.21 in the three subjects other than German is attained by 64 per cent of the Latin section, 50 per cent of the German section, and 52 per cent of the French section in the same three subjects.

TABLE III

PERCENTAGE OF PASSING GRADES

	English	Mathematics	Biology	Three	Language	Four
Group 1—						
Latin Section	86.7	73.8	85.6	82.0	69.4	78.8
German Section	72.9	66.2	75.7	71.6	61.2	69.0
French Section	78.6	67.4	78.6	74.9	57.7	70.6
Group 2—						
Latin Section	90.6	71.3	89.0	83.6	76.9	81.9
German Section	80.2	69.8	81.9	77.3	71.6	77.1
French Section	87.6	72.3	70.8	76.9	71.3	75.5
Combined—						
Latin Section	88.6	72.5	87.3	82.8	73.1	80.4
German Section	76.6	68.0	78.8	74.5	66.4	72.5
French Section	82.9	69.8	74.8	75.8	64.2	72.9

NOTE.—First line reads, in Latin section of Group 1, 86.7 per cent of English grades were 60 or more, 73.8 of mathematics, 85.6 of biology, 82 per cent of the grades given in English, biology, and mathematics; 64.8 of the Latin grades, and 78.8 per cent of the grades given in English, biology, mathematics, and Latin.

NOTE.—This does *not* mean in columns headed "Three" and "Four" that 82 per cent and 78.8 per cent of the pupils passed in all three or all four subjects, but that of the grades recorded in the three or the four subjects, 82 per cent and 78.8 per cent respectively were 60 or more. Grades *only* were considered, without regard to the subject or to the pupil who made them.

TABLE IV

PERCENTAGE OF LANGUAGE GRADES IN EACH GROUP, ABOVE MEDIAN OF GROUP IN THE THREE OTHER SUBJECTS

	GROUP I		GROUP II		COMBINED	
	Median	Percentage	Median	Percentage	Median	Percentage
Latin Section	67.56	46.7	68.18	49.0	67.91	47.9
German Section	63.21	44.7	65.19	38.3	64.69	43.2
French Section	64.51	31.2	64.98	44.0	64.76	37.4

NOTE.—Table IV reads, median of Latin section in English, biology, and mathematics was 67.56; 46.7 attained this median in Latin. Median of German section in English, biology, and mathematics was 63.21; 44.7 attained this median in German. Median of French section in English, biology, and mathemathics was 64.51; 31.2 attained this median in French.

NOTE.—As medians are based on similar data, the percentages show relative efficiency of the three language departments.

TABLE V

PROPORTION OF TEACHERS, OTHER THAN OF LANGUAGE, WHO TEACH IN MORE THAN ONE GROUP

Groups 1 and 2	English	Mathematics	Biology
Latin Section	7 out of 10	14 out of 15	7 out of 7
German Section	5 out of 9	8 out of 11	6 out of 7
French Section	8 out of 11	9 out of 10	6 out of 7

NOTE.—Claim may be made that best English, biology, and mathematics teachers are assigned boys who take Latin as their language. This table proves that the claim is not well founded.

TABLE VI*

CORRELATION OF EACH FOREIGN LANGUAGE WITH OTHER SUBJECTS

	L.E.	G.E.	F.E.	L.M.	G.M.	F.M.	L.B.	G.B.	F.B.
Pearson Coefficient	.581	.550	.338	.527	.521	.543	.331	.591	.428
Mutual Median Ratio	.495	.599	.472	.589	.571	.570	.240	.605	.446
Cosine Pi U	.513	.588	.605	.572	.529	.616	.212	.565	.652

* In obtaining these coefficients Group 1 only was considered.

TABLE VII

VARIABILITY OF EACH LANGUAGE SECTION IN EACH SUBJECT

(Based on Group 1 only)

	Medians	Quartiles	P.E.'s	A.D.'s	Sigmas	Coef.V.	Rank
English in—							
Latin Section	69.51	75.46–60.51	7.5	8.6	11.2	1.03	2
German Section	64.33	72.50–55.50	8.5	9.5	11.8	1.18	3
French Section	65.15	70.43–59.64	5.4	8.0	10.4	.99	1
Mathematics in—							
Latin Section	65.18	77.49–54.57	11.5	13.4	17.0	1.66	1
German Section	60.47	72.44–47.52	12.5	13.9	18.0	1.78	2
French Section	64.54	78.45–49.85	14.3	14.5	17.7	1.80	3
Biology in—							
Latin Section	65.37	76.18–59.92	8.1	8.5	12.2	1.05	1
German Section	63.16	70.29–58.53	5.9	9.4	12.7	1.18	2
French Section	62.08	70.47–59.64	5.4	10.5	14.6	1.33	3
Language in—							
Latin Section	65.33	78.48–50.52	14.0	13.5	16.0	1.67	2
German Section	60.21	70.38–49.56	10.4	14.0	18.3	1.80	3
French Section	59.89	70.32–46.52	12.2	12.1	16.2	1.56	1

NOTE.—Coefficient of variability equals average deviation divided by square root of median. Sections are ranked from lowest to highest degree of variability. Quartile column shows that Latin section in every subject has its 50 per cent of cases start higher in the scale and end higher in the scale than either the French or German section. The only exception is the upper quartile of Mathematics in the French section.

CONCLUSIONS BASED ON TABLES

1. The Latin group holds first place in every subject; the German second in biology and the foreign language; the French group, in English and mathematics. On the whole, the difference between the German and the French groups is very slight (see Tables I, II, III).

2. No group does so well in the foreign language as in the other subjects. The descending order of excellence is Latin, German, French (see Table V).

3. Difference in grades is not due to distribution of teachers (see Table V).

4. The order of degree of correlation depends upon the method used (see Table VI).

5. The increasing degree of variability is as follows: in English and foreign language, French, Latin, German; in mathematics and biology, Latin, German, French; in all subjects by sum of positions, Latin, French, German.

NOTE.—The P. E.'s in biology, the Sigmas in mathematics, and the P. E.'s and Sigmas in foreign language do not bear out the above conclusions (see Table VII).

The second investigation attempts to discover to what extent pupils are retarded in high-school mathematics, and of the relation of this retardation to elimination. The problem divides itself into three separate problems: one, retardation among those who graduated; two, retardation among those eliminated; three, retardation among those at present in school. The data for this study were secured from cumulative record cards which have been kept in the school under consideration for a number of years.

TABLE VIII

RETARDATION AMONG ALL GRADUATES

No.	1	2	3	4	5	6	7	8
102 (L)	5	7	8	9	21	26	9	8
174 (G)	8	15	15	16	21	44	8	8
10 (I)	1	3	2	1	1	6	0	1
286	14	25	25	26	43	76	17	17
Percentage	4.9	8.7	8.7	9.1	15.0	26.5	5.9	5.9

Table VIII shows the incidence of retardation among the graduates of the school. The table reads: Of the 286 pupils who have graduated from this school, 14 or 4.9 per cent failed in first-term mathematics, 25 or 8.7 per cent in second term, etc. There is a constantly increasing tendency of failure as we go up through the sixth term, and then a decided drop for the seventh and eighth terms. The first six terms are required, the seventh and eighth terms elective and therefore taken only by those who care for mathematics or need it for entrance to college. Taking this into consideration, the table shows that the work becomes more and more difficult as they go along through the required work.

Table IX is a summary of the incidence of retardation for those who did not graduate, but left before graduation, either by elimina-

TABLE IX

SUMMARY SHOWING INCIDENCE OF RETARDATION

No.	1	2	3	4	5	6	7	8	
13	0	0	1.5	1.5	3.8	4.6	3.1	3.8	8
34	0	20.0	29.4	32.3	35.3	58.8	29.4	....	7
95	10.5	17.9	18.9	30.5	32.6	70.5	....	....	6
85	9.4	12.9	21.1	28.2	68.2	....	....	....	5
243	10.2	24.1	28.4	63.4	....	....	....	....	4
444	18.0	21.6	45.0	....	....	....	....	....	3
663	26.5	50.7	....	....	....	....	....	....	..
978	65.6	....	....	....	....	....	....	....	..

tion outward to work or to another school or upward to college. It reads as follows:

Of the 13 boys who finished 8 terms of mathematics, not one failed in either first- or second-term algebra, 1.5 per cent failed in the third and fourth terms, 3.8 per cent the fifth, etc. Similarly of the 34 boys who finished 7 terms, none failed in first term, 20.0 per cent failed in second term, 29.4 per cent failed in the third term, and so on through the table. Two prominent points at least stand out of the table. In the first place, for every grade there is an ever-increasing percentage of failure in mathematics through the required six terms, showing that the work becomes more difficult the farther along the pupils go. The other very prominent point is the fact that not counting the cases of the seventh- and eighth-term boys who were probably eliminated upward in most cases, the percentage of failure for the last term completed is at least double the term immediately preceding. There is an increase of 22.1 per cent of failure from grade one to grade five for the boys who had six terms of mathematics or an average of 5.5 per cent of failure per term. The sixth term shows an increase of 37.9 per cent over the fifth term, or not quite twice as much as the percentage failing in that grade. There can be no doubt that there is a close connection between elimination from school and failure. Pupils leave school, not because of economic pressure, or a desire to work, but because they fail, become dis-

couraged, and therefore commence to look about for an excuse to leave school.

TABLE X

Relation of Eliminates of Each Grade to Total

No.	1	2	3	4	5	6	7	8
2,555	978	663	444	243	85	95	34	13
Percentage	38.3	25.9	17.4	9.5	3.3	3.7	1.3	.6

Table X is of interest in that it shows that 90.1 per cent of the 2,555 boys whose records were examined, left school after completing four terms or two years of mathematics. And similarly Table XI shows that of the 2,226 cases of failure, 90.2 per cent are in the first four terms. That is, the greatest amount of failure is in the easier classes.

TABLE XI

Relation of Failures among Eliminates of Each Grade to Total

No.	1	2	3	4	5	6	7	8
2,226	942	527	317	220	106	93	14	5
Percentage	42.3	23.7	14.3	9.9	4.8	4.2	.6	.2

TABLE XII

Ratio of Failure in Grade to Number in Grade

Grade	1	2	3	4	5	6	7	8
Ratio	1.11	.91	.82	1.04	1.45	1.14	.46	.33

Table XII was obtained by dividing the percentages in each grade of Table X by the corresponding percentage for the grade in Table XI. This ratio would show whether the grade contributes its fair share of failure. Grade four seems to be all right. Grades one, five, and six contribute more than their rightful share of failure, and grades two and three less, etc. Grades five and six, being the most difficult, naturally contribute the greatest proportion of failures. Grade one, being the easiest for those who persist, needs revision, probably on the part of the teaching staff, by giving the ablest teachers to that grade.

TABLE XIII

Summary Showing Incidence of Retardation for Pupils now in School

No.	1	2	3	4	5	6	7	8	
39	2.5	0	5.1	2.5	2.5	10.2	0	20.5	8
93	6.4	9.6	4.3	11.8	6.4	13.9	17.2	....	7
157	6.3	11.4	7.6	17.8	21.7	33.1	....	....	6
180	11.6	16.7	12.8	13.9	25.0	....	....	....	5
180	8.9	12.8	20.5	33.9	....	....	....	....	4
231	13.8	9.5	31.1	....	....	....	....	....	3
279	30.8	48.3	....	....	....	....	....	....	..
533	37.7	....	....	....	....	....	....	....	..

Table XIII shows the incidence of retardation of pupils still in school and reads as follows: Of the 39 pupils who had finished eight terms of mathematics and had not yet been graduated, 2.5 per cent failed in first term, 5.1 per cent in third term, etc.

The third investigation consists of a study of the correlation of the abilities of secondary school pupils. In the othe two papers, the pupils considered were all boys. In this third investi-

TABLE XIV

Summary for 121 Graduates

No. Pupils	Subject	Median	Standard Deviation	Subject	Median	Standard Deviation	Coeff. of Corr.
121	English I	76	6.9	Algebra I	81	10.0	+.30
87	Latin I	81	11.9	English I	77	6.4	+.42
87	Latin I	81	11.9	Algebra I	81	9.8	+.38
60	Latin I	81	12.5	History I	82	9.8	+.67
27	Latin I	77	9.8	Science I	79	7.8	+.37
121	General Average	79	7.7	English I	76	6.9	+.72
121	General Average	79	7.7	Algebra I	81	10.0	+.64

TABLE XV

Summary for 255 Pupils

No. Pupils	Subject	Median	Standard Deviation	Subject	Median	Standard Deviation	Coeff. of Corr.
255	English I	72	10.8	Algebra I	75	15.3	+.54
177	Latin I	74	16.1	English I	72	10.8	+.68
177	Latin I	74	16.1	Algebra I	76	15.5	+.69
106	Latin I	76	16.9	History I	76	16.3	+.75
71	Latin I	71	14.3	Science I	72	9.6	+.66
76	History I	73	15.3	Science I	73	13.4	+.88
183	History I	74	15.9	English I	73	10.6	+.74

gation the pupils were girls and comprised the entire class entering the first year's work in September, 1907. The total number of pupils entering the school was 341. Of these 86 did not complete a year's work, and are therefore omitted. Of the remaining 255, 113 were graduated in four years, 8 were graduated in five years, 2 have not been graduated, and 132 withdrew before graduation. In the high school in which the investigation was made, English I and Algebra I are required of all pupils. Latin I, History I, and Science I are elective. The marks given to pupils ranged from 50 per cent to 99 per cent. The medians given in the tables which follow, indicate in each case the position above and below which half of the marks were found.

Tables XIV and XV summarize the marks given to each group of pupils and the relationship of abilities in the several subjects as indicated by the Pearson coefficient of correlation.

A STUDY OF ASSOCIATION IN CHILDREN OF THE ELEMENTARY SCHOOL

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We are no longer interested in a purely theoretical discussion of the problems of education. It has been proved in recent years that most of the things we wish to know concerning the educative process submit themselves very readily to experimental study. As in the kindred field of experimental psychology, educational problems can usually be worked out empirically if we are accurate enough concerning the technique of the method, and conservative enough as to the meaning of the data obtained. The method of attack in experimental education is difficult at present, because there are few traditions, few well-wrought-out lines of procedure, and few individuals who are sufficiently skilled in this approach to the necessary solutions. However, the measuring rod is being applied, even though crudely, to almost every phase of educational procedure, and scales for determining efficiency are becoming common. By means of the Binet scale we can now measure the psychological age of a child within a small probable error. The Courtis arithmetic tests make it possible for city superintendents in California and Florida to measure their students by the same standard, and thus compare their abilities. Efficiency in all lines is being measured by scales which render results comparable.

The present discussion is based upon an investigation of the associative abilities of children in the elementary school from the third grade to the eighth grade inclusive. Children from various school systems in Central Indiana were tested in groups, usually grade by grade. The special problem was to measure quantitatively the capacities of children in these grades to make associations.

This work was undertaken for several reasons. In the first place, educability has always been deemed very closely related to associative ability, or the ability to properly co-ordinate and

connect sense material. Quick and accurate associations are usually marks of high intellectual capacity, or at least have been so regarded by educators. It seems highly desirable to measure the correlation between efficiency in this trait, and learning ability, as shown by school grades and the actual achievement of the schoolroom. In the second place, this investigation was undertaken because of the findings of a previous study made upon children in a city in Central Indiana in which it was found that there is no correlation between visual and auditory acuity, and the ability of students to do well in the regular work of the public schools. Indeed it was found that there is a negative correlation, and that there is quite a probability that a student who has poor vision may rank very high in his classes in school. Likewise poor audition is not correlated with poor scholarship. The results of this study, made by four graduate students of Indiana University, were so startling that we at once started an investigation to find out the psychological factors that are most intimately related to success in school work, as measured by the standards of our best school systems. To this end our study was directed to the associative abilities of children. Third, from previous tests upon delinquent girls in the Indiana Girls' School it seemed probable that a scale might be developed from carefully arranged association tests which would provide us with a means of measuring intelligence with fully as great accuracy as other scales now in use. Consequently, this was one of the purposes of the investigation, and one which proved most fruitful. Finally, the investigation of the associative abilities in children is probably one of the most fruitful fields of investigation in child psychology at the present time, because of the light it throws upon child nature in general and child abilities. Their free associations indicate child character in a manner which may later be scientifically interpreted in terms of vocational guidance and life pursuits. We have only touched the surface of this interesting and fruitful field. Incidentally, this investigation throws light upon our present rough methods of gradation and classification. So far as associative abilities are concerned, children cannot be said to be classified with any degree of accuracy by our present methods in the public schools. They

are classified according to biological age, and it is not uncommon to find as great individual differences among members of a grade as are shown by the difference in medians of the fourth and seventh grades, or the third and sixth.

In getting the data from the public schools it was arranged to give ten different association tests in each grade above the second. The tests were so simplified that the whole series could be given in ten minutes of actual effort on the part of the pupils, thus avoiding fatigue. The tests were made in different school systems, all, however, of standard efficiency as to organization and teaching force.

The following tests were made: Two methods of crossing out A's were used. In the first test four hundred A's were placed side by side, single space, in twenty rows, twenty A's in a row. Subjects were asked to mark out as many as they could in just one minute. In the second series the A test used by Thorndike and others was employed, which consists in crossing out A's that are distributed unevenly among other letters. Students were asked to cross out as many as they could in one minute. In the third test opposites were used. At a given signal they were asked to write the opposites of the following words as fast as possible: long, soft, white, far, up, smooth, early, dead, hot, asleep, lost, wet, high, dirty, east, day, yes, wrong, empty, top, north, sour, out, weak, good, after, above, sick, slow, large, rich, dark, front, love, tall, open, summer, new, come, male. At the end of one minute the signal stop was given. The next test was a form of controlled association, which so far as the writer is aware has not been used very extensively in testing children. Starting with the word garden, twenty associations were built up, each word suggesting the next. After all words had been suggested, and the chain of associations properly built up by suitable questions and by having them written on the blackboard, they were erased and the children were asked to reproduce them. They were given one minute time, as with the other tests, and scored according to the number of words remembered, and the efficiency with which the chain was reproduced. The words were: garden, flower, bees, honey, sweet, candy, Christmas, Christmas-tree, toys, Santa Claus, snow, sleighride, bells, church, steeple, sharp,

needle, thread, spool, wood. The next test was copying letters. Ten of the one-space letters in the script alphabet were used in a long series of miscellaneously arranged letters to be copied. Students were asked to copy the letter immediately above as rapidly as possible, and were scored according to the number of letters copied. In addition to the above, they were asked to add, subtract, multiply, and divide simple problems for one minute each, and were scored according to the number of problems solved. One other test was employed at the same time, which is not strictly an association test, but which was intended to throw light on the motor reaction of the child. This was the tapping test. At a given signal the children were directed to tap, with a well-sharpened pencil, within the area of an inch square. They were asked to tap as rapidly as possible for ten seconds only. This test, together with the one in which letters are copied, gives a very fair scale for measuring the rapidity and accuracy of motor reactions, in addition to showing certain phases of the associative process.

The above tests were made in nine different school systems in Central Indiana. Not all the tests were made in all the different systems. Not all made at the same time in the same system. The tests were made as the writer had time, and have been in progress for two years. But no single test for a grade is represented by less than thirty-five children nor more than seventy-four at present. It is hoped that in the near future we may extend these numbers greatly. Indeed, two large systems in Indiana have extended an invitation for the tests to be made throughout the whole system.

From the above study it is quite clear that the ability to make rapid and accurate associations is a very important factor in educability. From the records of the public schools it was possible to secure the class standing of each pupil tested, and there is a positive correlation throughout between the efficiency of the pupil in the performance of school tasks, and the score made in the association tests. This positive correlation holds for all the different association tests with the exception of tapping and copying letters. Here it does not appear uniform, there being several rather marked exceptions. Excluding these distinct exceptions,

general efficiency in school performances is correlated with motor associations and adjustments.

Not only is there a correlation between the school records of individuals and their association efficiency, but as we advance in the grades the medians of the association records of all pupils tested in each grade show a steady increase by almost a constant quantity for each grade. So that it seems possible, by refining these tests somewhat, and securing a much larger number of subjects, to make a scale for the measurement of ability, which will apply not only to individuals, but to grades as well. It may be possible to discover from such a scale, normals, Morons, and feeble-minded by simply applying it to a grade. This, of course, at present is a mere statement of opinion, but is based upon the actual results of the previous tests. Take one illustration of the record of a feeble-minded boy found in the fifth grade. The following is his record: A's crossed out from the first series, 17; A's crossed out from the second series, 11; controlled association test, 5; copying letters, 12; association by opposites, 6; tapping test, 27; adding 9; subtracting, 12; multiplying, 5; dividing, 0. Comparing these records with the medians of his grade for each test, he is obviously so far below his classmates that it would be impossible for him to perform tasks assigned to the median group. Again, it is possible for us to go down in the grades till we come to a point at which this boy's records are near the median of the group, at which point we have the boy's psychological or educational age. We actually find that his record is below the median of the records of the third graders. In other words he is two years beyond the grade in which he can do his best work, and his psychological age is approximately nine, whereas, his biological age is fourteen years. Numerous illustrations might be sighted to show that this scale works out in a fairly accurate manner for determining the amount of retardation in school work, and for determining the psychological age. The scale also indicates superior students even better than it points out the defectives. The reason for this seems to be that educability is quite dependent upon the very traits we are here testing. Naturally those with the highest capacities will make the best showing. It should be said that the Binet scale was

applied to a number of exceptional cases to see if the psychological age determined by this scale corresponded with that found by the association tests. It was found that in most cases the results were practically the same. There is a tendency, however, for the association scale to grade higher than the Binet scale. This may be due to the fact that the Binet scale, in some respects, does not seem to be well adapted to American children. It should be noted, however, that the central problem in the Binet scale is the determination of native, inherent, capacities, and is intended to determine how well the child has appropriated his sense material; in which respect it is intended to test the identical factors of mentality which are examined by means of the above series of association tests. It is not surprising, therefore, that the results obtained are similar.

Much stress has been laid upon the theory, in times past, that mental efficiency is dependent upon accurate sense organs. Wundt has pointed out that at best the human eye is a very poor optical instrument, possessing practically every defect that would be avoided in the manufacture of a perfect instrument. It is probable that all of our sense organs are imperfect mechanisms, yet they may be as satisfactory as is necessary from the philogenetic standpoint. What is more necessary than accurate sense organs is a brain with great capacity for assimilating the sense material brought to it; for properly associating and co-ordinating sense stimuli, and for properly connecting these impulses with the motor areas. Even when a brain is deprived of a whole group of stimuli, because a sense organ is wholly deficient, if the brain is so organized that it uses to advantage the stimuli received, the individual may rank high in the scale of intelligence. Morons, and feeble-minded not infrequently possess the very sharpest sense organs, but they lack the organizing mechanism in the brain. They are defective because they cannot associate and co-ordinate properly the very distinct material which their accurate senses present. They are supra-normal in sensation, but deficient in brain organization. Of course, every effort should be made to correct any sense defects that may be found in children, but it is entirely improbable that such correction will very materially

change the inherent ability of the child, or make his associative processes more accurate. It will simply relieve a pathological condition, and clear up sensory elements.

Our more exact studies of individual children; the application of scales for measuring efficiency, and our studies of retardation and promotion, indicate that two innovations in educational administration are at hand. The first is the educational psychologist or psycho-clinicist whose function in the public schools will be to apply to all pupils the various scales for determining efficiency and adaptability. To him should parents and school officials look for the solution of the problems of gradation, classification, promotion, and demotion, which alone will place our schools upon a psychological basis, rather than upon tradition. To him, in large measure, will be placed the responsibility of the determination of careers through vocational guidance. For how shall we undertake this difficult work unless we do it with a clear understanding of the psychological and physical traits with which we are dealing? The psycho-clinicist must come into public education, and to him we will look for the solution of some of our most difficult present-day problems. The second innovation which is now at hand as a result of the individual tendencies in education, is the new type of school administrator. School administration can no longer be a complex piece of machinery designed to mold all children after the same pattern, to carry the educative process forward in groups, equalizing all statures, allowing no stragglers, and no advance guard; driving all the children forward like a flock of sheep "along the straight road to the next division, where another shepherdess with the same ideals and the same training takes them in hand." But the school administration of the future must deal with the problem of the education of the child, not the group. The inflexibility and inelasticity of the present system must pass. The whole problem of school administration of the future is to give the child freedom and spontaneity, and to inculcate initiative and self-dependence in the individual, whether he be subnormal, normal, or accelerate.

INCIDENTAL INSTRUCTION[1]

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By "incidental" is not meant accidental: nor is the term used as synonymous with casual, chance, fortuitous, occasional, though these are all usually listed as synonyms. The term incidental is here used with the idea that such instruction is strictly subordinate to the main purpose: also that the subject in which such instruction is given is quite subordinate to a more important subject. Perhaps the word subordinate may be here used as an explanatory synonym. The incidental method is used in first-grade reading, when the mastery of letters, sounds, words, etc., is strictly subordinate to the enjoyment of the story read—even at the very first. The incidental method is used in teaching numbers when number is taught only as an instrument in some other study or activity. So also in teaching the German grammar, geometry, etc.

For some years the writer has taken rather careful note of the effort expended by teachers in giving instruction in such subjects as the three R's and other similar elementary school subjects; German, geometry, and other high-school subjects. It has seemed to him that the results as exhibited by the pupils are usually not commensurate with the effort on the part of the teacher in teaching or indeed with the effort on the part of the pupil in learning. There is a lack of economy. Too much is lost in friction.

Note briefly some results. When we men were in the first grade in school, we did well to *read through* the first reader that first year. Perhaps we read it through two or three times. About one book in each succeeding year was the extent of our school reading, and even some of this was done as assigned home work—

[1] At a moment of enthusiastic interest the author promised to write this article. Soon after, he begged in vain to be excused. He simply has not had time to make adequate written report on the topic assigned.

one book, and this not read with very much proficiency. In the second of the three R's, writing, the Springfield Tests support common observation that such daily exercises did not produce results commensurate with the painstaking efforts bestowed. Again, how much quantitative judgment and mathematical ability result from seven or eight years teaching and study under the guidance of the usual text in the elementary school?

But in the attainment of even such meager results, teachers have put forth an enormous amount of effort. One needs only to note the subjects of discussion at teachers' associations and more especially local teachers' meetings to become aware of the "methods," devices, and other schemes sought for as instruments in teaching the usual subjects. A careful critic cannot but conclude that the *how* of presenting some topic has superseded the *what* in teaching given pupils at a given time and place. Prizes, honors, grades, examinations, etc., are used as allurements or goads to study.

This last statement suggests a third situation which prompts the studies here reported, viz.: Pupils too generally look upon these allurements and goads with more concern than upon the subjects studied. Many a boy spells well for the sake of the headmark. Many a pupil—even the college student—studies to avoid the danger of not passing an examination. In all these studies here reported, it is not maintained that the several subjects are ends in themselves or final purposes, but rather that they are means or tools for securing something of value. Knowledge of arithmetic aids one in business transactions. Ability to spell is an asset in business correspondence. Such a use of our school subjects is normal and natural. But to use them as means of securing proffered prizes or as opportunities to avoid humiliation through failure in examinations—this is abnormal and artificial.

It is interesting to note how interrelated these three situations are. The pupil's interest in allurements and goads calls for more and more artful devices by the teacher and insures increasingly unsatisfactory results. The more attention given by teachers to alluring devices, the less direct will be the interest of the pupil and the less valuable will be the results of his pretended study.

Results are always unsatisfactory when the pupil is only indirectly concerned and when the teacher attends primarily to artificial methods rather than to genuine content.

These three situations have prompted the investigations reported below. In all these investigations the traditional school studies are regarded as instruments to be used in various activities of life. It is recognized that it is well for pupils to become acquainted with the leading principles included in these traditional studies, but at the same time such studies are here regarded as strictly subordinate to the studies of real life.

The one problem in all these investigations is, in short: To what extent can the essentials of the traditional school studies be acquired, incidentally, while the attention of both teacher and pupil is directed to the study of real, concrete activities in life?

The following studies bearing upon the problem have been made by graduate students writing Masters' theses under the writer's direction in the University of Missouri.

1907–8. "An Experiment in the Seventh Grade of the Teachers College Elementary School in the Attempt to Find a Principle Which Would Remedy Some of the Defects of the Present Elementary School Curriculum." Ernest Horn.

1909–10. "An Experimental Study of Methods of Teaching High-School German." Mamie Clarahan.

———. "Practical Problems Depending Upon Principles of Geometry." Byron Cosby.

1910–11. "Physics in the High School." A. T. Powell.

1911–12. "Historical Data in the Study of Present-Day Problems." G. M. Cornett.

———. "Incidental Teaching of English Composition in the High School." Eleanor Kleeman.

Excerpts from two of these theses will indicate something of the problem, methods, and results.

In Elementary School Work

(Thesis by Mr. Horn)

"*The Purpose of the Experiment:* The purpose of the experiment, was to discover, if possible, a way of avoiding some, at least, of the difficulties pointed out in the two preceding chapters." Reference is made to (1) crowded curriculum, (2) mere words, not meaning, (3) lack of motivation, (4) loss of the logical element.

"*Method:* The year was spent in studying the development of the United States, by reproducing each period of the development with its dominant problems. These problems became real problems in two ways: (1) in tracing back to its cause some growth or occurrence, (2) in re-living in imagination the problems of the people of each period. Ultimately all problems became of the second sort. The method followed in the study of these problems was as follows: (1) The situation out of which the problem arose was reproduced as vividly as possible in imagination, so that the real difficulty would be felt, and the need for a better state of affairs desired. (2) The pupils were then led to offer possible ways of alleviating the difficulties, and then to consider in what way such problems were really solved. To make the problems more real they were made, wherever possible, the problems of the character, or characters, most instrumental in their solution.

"The subject-matter of the studies of the curriculum, as given in the table . . . . was made use of whenever it was needed in the solution of some of the above problems."

Only one illustration can be here given to show how one of the three R's was taught incidentally:

"All work in arithmetic was done only to aid in the solution of some problem concerning the development of the United States. All were real problems except in cases when the pupil was unable to carry on the processes required. Usually drill was needed by only part of the class. In such cases the other members of the class were free to continue their computations. Care was taken to see that the methods used were of the most economic kind. With the above exceptions every problem dealt with concrete material. . . . .

"*Content:* classified under the headings given in the ordinary textbooks in arithmetic, the following processes were used. . . . .

1. Addition.
2. Multiplication.
3. Subtraction.
4. Division.
5. Common fractions with very small denominators such as one-half, one-third, one-fourth, etc. Fractions which necessitated the use of large denominators were always expressed in decimal form.
6. Decimals.
7. Percentage.
8. Interest. Study of the national bank, economics of slavery, etc.
9. Taxes.
   a) Tariff. Jackson's administration.
   b) Direct. Revolutionary War. Civil War.
   c) Income tax. Civil War.
   d) Internal revenue. Spanish-American War, Civil War.

10. Money. Foreign exchange.
    a) English. Estimates of colonial industries.
    b) French. Louisiana purchase.
11. Ratio. Comparisons.
12. Square measure. Public land policy. Railroad grants.
13. Cubical measure. Estimation of a ton as a measure of shipping capacity.
14. Linear measure.
15. Metric system. In weighing the cotton from which the class had picked the seed, in order to understand the importance of the cotton gin as an improvement over hand labor, only gram weights were available. These weights were then expressed in avoirdupois.
16. Profit and loss. Protective tariff.
17. Square root. In getting more perfect ideas of areas by comparing them as to lengths and breadths.
18. Longitude and time. Knowledge of the world in 1492. Magellan's trip around the world.

"These topics did not receive an equal amount of interest. Some did not occur frequently enough to give exercise in their processes equal to that given in the ordinary course of study. This is true of: interest, cubical measure, square root, cube root, metric system, and common fractions with large denominator. On the other hand the four fundamental processes, decimals, and percentage, were much more used than in the ordinary course of study. In the processes frequently used an unusual degree of speed and accuracy was developed."

Among Mr. Horn's conclusions, No. 2 is pertinent here:

"2. The number of studies, as separate studies, could be lessened by teaching the following studies incidentally, i.e., as by-products of the study of problems of the nature of those described in Chapter . . . .

1. Reading (oral expression).
2. Writing (penmanship).
3. Spelling.
4. Grammar.
5. Composition.
6. Arithmetic.
7. Geography.
8. Nature-study.
9. Physiology.

"The problems in the solution of which these studies could be taught incidentally are not confined to those of history and literature. Especially in the case of arithmetic, geography, physiology, and nature-study, these problems might be better found elsewhere, for example, in manual schools,

cooking, etc. There is less chance of waste, from unnecessary repetition, in the case of these studies, since they are taught only where needed."[1]

In Secondary School Work

(Thesis by Miss Clarahan)

"The *problem* was: How learn grammar in the first year and not give this study undue emphasis? How acquire an easy reading knowledge and yet not be superficial? How attain some ability in the use of the spoken language and yet not make this the chief aim? How, finally, adapt the work to the interests of high-school students?"

In this investigation five sections of first-year students in German were used, sixty-seven students in all. No attempt was made to arrange them according to age, ability, preparation, and the like—they were simply allowed to enter the sections most convenient for their schedules. The five sections were about equal in number. Sections I and IV used what may be called the Grammar Method; Sections II, III, V used the Reading Method.

The grammar sections followed closely the text, Spanhoofd's *Lehrbuch der deutschen Sprache*, until the first week in April, when thirty-three of the thirty-five "lessons" of the book were completed. The reading sections read the simple German story-books in the order here given: Foster, *Geschichten und Märchen* (102 pages); Guerber, *Märchen und Erzhälungen* I (92 pages); Allen, *Herein* (36 pages). These reading sections read for the pleasure of the stories. No grammar text was used. The only grammatical work was given by the teacher, incidentally, as needed in the reading.

The first week in April an examination was given to all five sections together.

"The questions called for the use of a vocabulary which should be familiar to any class at this period of work, but which was not taken expressly from any material used in any class. They called for declensions of nouns with adjectives, using both definite and indefinite articles; for principal parts and conjugations of verbs, both strong and weak; for comparisons of adjectives; for a translation of a German selection, taken from a book unfamiliar to any class; and finally, for a translation of English sentences into German. This last question called for a knowledge of word-order, normal, inverted, and

[1] Editor's Note.—Professor Meriam is preparing for publication a book on the reconstruction of the elementary school curriculum on principles in accordance with which this thesis was written. But no report of it is available at this time.

transposed; of personal and relative pronouns; of adjectives used with nouns and as predicate adjectives; and of cases governed by different prepositions."

Immediately after this examination, the grammar sections and reading sections exchanged work; the former reading, the latter studying grammar. After six weeks—at the close of the year—a reading test was given all students. Tables showing a portion of Miss Clarahan's conclusion cannot well be given here, but the following excerpts are significant:

". . . . It has been seen that the reading sections which gave the study of grammar much less emphasis than the grammar sections—and probably much less emphasis than is usually given this study in the first year's work—stood better in a grammar test given before they had even begun on the final period of their work, the period devoted to grammar study. It has also been seen that these same sections stood decidedly better than the grammar sections in a reading test given toward the close of the year, after the grammar sections had spent a month and a half in reading. Moreover, the amount of reading material covered in the reading sections was very much more than that covered by the grammar sections. The former read two books and part of a third (230 pages in all) and the latter not quite one book (81 pages). This does not, of course, include the grammar text.

"Earlier in this paper it was said that the methods were to be judged according to the comparative success with which the aims were realized and the problems connected with these aims were solved. It may be concluded then, that, as far as the aims regarding grammar, pronunciation, and reading are concerned, the reading method, as used, has proved decidedly the better. Moreover, from what has been said it is evident that the reading method has been more successful in solving at least two of the problems raised: How learn grammar and yet not give this study undue emphasis? How acquire an easy reading knowledge and yet not be superficial? . . . .

"We come, finally, to the problem of interest. Here, also, it may be said quite unhesitatingly, that the reading method seemed better adapted to the interests of the students than did the grammar method. This statement is based, not only upon careful observation of all classes, but upon the opinions expressed by the different supervisors and teachers and, more especially, by earnest students. During the first semester of the work especially the difference between the two sections—that is, between reading and grammar sections—in this respect was very evident to those who went from one class into another for the purpose of observation. The reading sections were doing work of a more concrete character and it was natural that their interest should be greater. Moreover, it was natural that they should be more interested in the systematic study of grammar taken up after they had not only acquired a large German vocabulary but had also learned, incidentally, many things concern-

ing the formal side of the language, than the grammar sections were at the beginning of the year, when the language was new to them.

"It may be concluded, then, from the study and comparison of these two methods, that the reading method, in that it has more nearly realized the aims of the first year's work in German and more successfully solved the problems connected with this work, is the better adapted for high-school use."

Neither time nor space allows a similar examination of the other investigations made. All show—in their limited way—the effectiveness of the "incidental method" in teaching the traditional school studies.

Only one word need be said here as to the implications of such investigations. They point in the direction of the tendency of all school work, viz., an emphasis upon the real things of life rather than the formalities of life. It means that these formalities will be taken care of, incidentally, if attention and effort are directed primarily to the realities of life. It means that the content of the public-school curriculum will be so changed that pupils will soon study as directly as possible, the real activities of men instead of the empty formalities found in most texts.

A NEW METHOD IN THE HISTORY OF EDUCATION

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It is the writer's privilege to conduct two courses in the history of education. The first is a general course, sixty hours in length, having about sixty-five students, both men and women, in which the method used is a combination of the lecture and textbook methods. The other is a seminar course, likewise sixty hours in length, with about a dozen students, both men and women, though the men considerably predominate. The method to be described is being worked out in the seminar course, but when the results are sufficiently organized, they will probably be embodied in textbook form and constitute the basis in part of the general courses also.

The need we faced in adopting this method was that of making the history of education more useful to teachers and school administrators. "Why do you study the history of education? Does it make you a better teacher or supervisor?" The first question when put to my students usually brings out the fact that the history of education is a part of some examination they have to pass for promotion; in the pursuit of the study, however, they hope for some cultural and disciplinary results. The answer to the second question is in the negative, except it is recognized that in a very general kind of way the study may prove profitable. This experience can doubtless be duplicated in most schools of education. The study of education in college departments naturally does not contemplate such practical results, being more cultural in purpose, but before we are through this account it may appear that even the cultural results would be better on the basis of the new method. The normal-school men with whom I have talked about the matter very generally agree that the history of education does not particularly function in the future work of their students.

The history of education is perhaps the least valuable feature today in the training of teachers; it is perhaps also the least emphasized; yet the dignity of the subject has enabled it to maintain its place despite the poor results coming from its study. The reason for this situation is the remoteness from modern educational problems of the history of education as traditionally handled. *The problem* is then, How in the training of teachers may the history of education be made useful as well as cultural? The question is not, as hitherto, What should teachers know *about* the history of education? but, What may teachers learn *from* the history of education? How may the history of education, judged by the results of its study, be made indispensable to prospective school people?

The answer in general is, By connecting the history of education vitally with modern educational problems and life, and this *the new method* tries to do. It begins by making the modern educational problems the criterion of what is to be studied in educational history. It then studies the historical antecedents of those problems, treating the history of the problem as a series of unconscious experiments performed by the race, through the study of which we may learn in what direction to look for the present-day solution. The idea is not to solve modern problems by historical analogies, but so to understand the history of modern problems that their solutions become clearer to judgment and insight. Not everything in educational history is treated, but only those things that help us to understand the main modern educational needs. This seminar course in our bulletin is described as involving "an extensive study of some contemporary educational problem in the light of its history."

In brief, the new method is topical, developmental, extensive, and practical. Our seminar does not aim to treat exhaustively a small point in past educational history, but to treat profitably a real modern problem in the light of its antecedents. No particular philosophy of history is necessarily involved, though such a mode of treatment, by adopting the evolutionary point of view, is a good basis for speculative interpretations. The students, I may say, like the method, and we think we are getting somewhere.

Some of the problems, for example, which have been or are being so treated by different students in the seminar or by myself are: The Organization and Administration of City Schools; The Status of the Teacher; The Education of Woman; School Discipline; Religious Education; Vocational Education; The Teaching of Geography; Secondary Education; The Treatment of Atypical Children; Faith in Education, and Educational Method.[1] In each case the historic review of the problem yields a contribution toward the solution of the problem itself. Such a mode of treatment is not the traditional intensive and thorough examination of a single question at a particular time, but an extensive review of a problem in a developmental way throughout all the periods it is profitable to consider. I may add that those discussions were written before the appearance of J. H. Robinson's *The New History*, with whose point of view I am in full sympathy. Robinson applies to social institutions a method similar to the one we would apply to modern educational problems.

It should be remarked that students are not required to adopt this new extensive way of treating a subject but, if they prefer, they may choose a subject requiring the former intensive mode of investigation. At the very time at which the topics mentioned above were being worked out extensively, other students were engaged intensively in such inquiries as: The Influence of Montaigne on Locke; The Origin of the University of Paris; The Effect of the French Revolution on Education; and The Educational Philosophy of Rudolph Eucken. Thus it is not intended that the new method should exclude the old, but only supplement it.

The advantages of this method have perhaps been sufficiently indicated in describing the present need in teaching educational history and in defining the method itself. In brief these advantages are: to bring the history of education into the present world; to make it practical, useful, and vital; to justify its place in the training of teachers; to improve the present-day educational judgment;

[1] Illustrations in print of how such a mode of treatment is worked out and applied may be found in the author's *Idealism in Education*, pp. 97–118, where the problem is that of "The Individual vs. Society," or in his *Free Will and Human Responsibility*, chap. ii.

to unite the past and present in the interest of future educational progress; and to feel the push of the centuries in a certain direction regarding a given problem. Though this view is particularly usable in normal schools and teachers' colleges, it may in the end come to be recognized as best also for cultural purposes in the colleges.

There are five possible *objections* that may be anticipated at this point. This method, it may be said, is not new after all; it is not a complete method in itself; it lacks unity; it is superficial; and it trespasses on the field of the course in "Principles of Education."

There is certainly weight to these objections, to which I would reply, perhaps unsatisfactorily, as follows: The method is new in the treatment of educational problems, so far as I am aware, though it is indeed generally customary for speakers on an educational problem to preface their views with a certain historical orientation. Janet and Séailles applied a similar method to philosophical problems. I came upon this method personally very slowly, partly through a year of residence in Germany, partly through having to teach the history of education without knowing much about it, and mainly through facing the sense of need for doing something different.

It is to be admitted that the method is not complete in itself, providing no rounded picture or general view of a particular past period, which the cultural study of a subject requires more than does the practical. This particular difficulty we offset in the seminar course by requiring each student in the course of the year to present a written review of some general text in the history of education. On the other hand, neither is the traditional method complete in itself. We are recommending the new method only as a supplement to the cultural and the intensive.

Unity of a certain kind the method does lack; it does not drive abreast all educational material through each past period in the customary fashion. On the other hand, a series of lesser unities the method does involve, and a more compact unity about a smaller nucleus. And it is this new kind of unity that particularly gives value to the application.

There is indeed an appearance of superficiality in an extensive treatment covering many periods on a specific problem, especially in comparison with the former seminar method of very intensive treatment of a particular problem of a given period. But in respect to the new purpose in view the treatment need not be superficial, for we are not asking for all that is known on a subject, but only for all that counts. What has no guidance in it may be omitted, without deserving the charge of real superficiality.

This method may indeed trespass in its application on the course in "Principles of Education." This would not be embarrassing in cases in which one man gave both courses, though needless repetition would have to be avoided. In cases in which two or more men were involved, the historical application would only come in to re-enforce the course on "Principles," which ordinarily seeks its supports elsewhere than in history. Such re-enforcement would tend to give unity in effect to our work, which is badly needed at present.

Finally, readers of this paper do not need to be told what use they may make of it. That a method succeeds in one case is not a proof of its general virtue. The writer welcomes the criticisms that are to follow and would welcome also reports on the actual trial of this method under other conditions. But if the method is rejected, the problem still remains, What is to be done to make educational history function in the lives of teachers?

AN EXPERIMENT WITH THE COURTIS TESTS IN ARITHMETIC[1]

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The principal objects of this experiment were to measure the growth in arithmetic abilities of fifth-grade pupils during approximately one-half school year, and in particular to determine the effects of special training in two directions, viz.: (1) in the improvement of reasoning ability by special attention to "problem" work, and (2) in the correction of individual deficiencies by special efforts of both teacher and pupils to bring the individual records up to the "standard" scores for the grade.

The experiment was conducted as follows: The Courtis Standard Tests in Arithmetic were given to two fifth A grades in the Knoxville public schools on Friday and Monday, February 16 and 19, and repeated thirteen weeks later, on Friday and Monday, May 17 and 20, 1912. The second tests were of the same character and difficulty as the first, but, except in the case of some ten control pupils who took the identically same tests as at first, the examples and problems were varied.

The details of the tests and the methods of scoring need not be entered into further than to state that so far as possible all conditions of all the tests were the same, and all the suggestions given by the author of the tests were followed carefully. One variation, probably immaterial, was that the present writer gave the first day's tests to both groups both in February and May, while the teachers of the respective grades gave the second day's tests both in February and May.

The Courtis Tests comprise eight separate tests printed on as many sheets with space both for answers and all necessary compu-

[1] The writer wishes to make special acknowledgment to Miss Mary Beard, one of his students and a teacher in the Knoxville schools, through whose co-operation and assistance the material for the above study was secured.

tations, and placed in the hands of each pupil. They are given in two sets, the first comprising, in the order given to the pupil: (1) Test No. 5, speed test, copying figures, time one minute; (2) Test No. 2, speed test, subtraction, simple examples, time one minute; (3) Test No. 8, reasoning, a list of "two-step" problems, time six minutes; (4) Test No. 3, speed test, multiplication, simple combinations 0 to 9, time one minute. The second set, given at a second sitting, comprises, in the order given to the pupil: (1) Test No. 4, speed test, division, simple examples, time one minute; (2) Test No. 6, speed test, reasoning, a list of problems with space opposite each in which to indicate the operation to be performed without working the problems, time one minute; (3) Test No. 1, speed test, addition, simple combinations 0 to 9, time one minute; and (4) Test No. 7, fundamentals, abstract examples with large numbers involving one of four fundamental operations (e.g., 4,387–165=), time twelve minutes.

As to the method of scoring it may be said that in only three tests (Nos. 6, 7, 8) is it considered necessary to take account of errors. In these tests scores are given both for "attempts" (meaning number of answers written in proper column) and "rights" (the number of such answers which are correct). Courtis' method of computing results by using averages, average deviations A.D. (not included in the tables), and variability has been followed. The averages are accurately calculated; the variability is obtained by dividing the A.D. by the average, i.e., $\text{Var.} = \frac{\text{A.D.}}{\text{Average}}$

One room, designated as Room II, was used as a control group, while the other, Room I, was given special training in reasoning and the pupils stimulated to improve their scores individually by being told their scores, by constructing graphs of them, and comparing them with the standard scores. The training in reasoning consisted chiefly in requiring much work in solving problems and in arousing interest in problem work, largely absent at first, by special efforts on the teacher's part, such as having pupils invent problems from their everyday life for solution by the class. About half the time for arithmetic was given to this kind of work, the remainder to the regular work of the grade, a review of common

and decimal fractions. The length of the recitation period (40 minutes) was not increased, though some additional time was given for study and individual help, amounting perhaps to from 5 to 10 minutes daily, above that given by the control room. The control group was taught as usual, the teacher giving "very few, practically no problems," believing, as she herself stated, that "teaching fifth-grade children to reason was a waste of time." The pupils of this room were not informed as to their individual scores, nor did they know that a second test would be given, while neither room knew the purpose of the tests nor that the two would be compared. Both teachers, however, knew about the experiment, being members of the writer's education seminar.

The total number of pupils from whom records were obtained was 93, 46 in the control, 47 in the practice group, but of these only 38 and 41 respectively were complete. Both groups were composed of children from the same class of society, while the average ages of both were exactly the same, 12.3 years, with practically the same variations from the average. The chief dissimilarity was in the relative numbers of boys and girls. Room I (practiced) included 14 boys and 27 girls; Room II, 18 boys and 23 girls.

The results of the experiment are given in both tabular and graphic form in Tables I, II, III, and IV, and in Figures A, B, and C.

Table I and Fig. A[1] show the changes in the average scores of each grade in each test, their relative standing before and after training, and the variability in the scores. In the first tests the practiced group showed a considerable superiority over the non-practiced in all the tests except the one chiefly indicative of reasoning ability (Test 8), in which the non-practiced group did approximately 10 per cent better than the other. In all the tests for fundamentals (Nos. 1, 2, 3, 4, 7) the practiced group was from 12 per cent to 38 per cent superior, except in addition, in which both groups were equal.

[1] The Courtis chart for this is reproduced with the consent of the designer, S. A. Courtis, Detroit, Mich.

The significant facts shown by the final tests are, in my opinion, the following:

1. The practiced group made a decided and consistent average improvement in reasoning ability as measured by Tests 6 and 8 over the non-practiced group. In spite of the initial inferiority in reasoning (in Test 8) as shown above, the practiced group surpassed the other in the final test by an average of 25 per cent in attempts and 11 per cent in rights. In absolute growth, moreover, the practiced group showed, on an average, 80 per cent gain in both attempts and rights, while the non-practiced group showed only 23 per cent and 45 per cent respectively.

2. A striking increase in *uniformity* of performance along with improvement is also shown in the practiced group as can easily be seen from the graphs in Fig. A. In other words the efforts to bring the grade up to the standard were signally successful in practically all of the eight tests. This involved the raising of the average scores in some tests by a full grade, and in others (Tests 6 and 8) two full grades or more. This improvement is shown most clearly by the straightness of the curve for the May tests and by the fact that eight of the eleven scores lay within the limits assigned to the sixth grade. No such uniformity is shown in the non-practiced group. The same facts may be shown by comparing the variability of both groups in all the tests. Thus, while the average variability for all the initial tests was practically the same for both groups, for all the final tests the variability of the non-practiced group was relatively 33 per cent greater than that of the practiced.

3. When we study the individual performances of the pupils, however, instead of the grade averages, we find a striking lack of uniformity and the most marked individual variations. This can be shown, in part, by dividing each group into three classes: (1) the gainers, (2) the losers, (3) the stationaries. Table II and Fig. B show these classes for Test 8. Thus it would appear that of the practiced group 7 per cent made no gain and 7 per cent actually lost in attempts, while 20 per cent made no gain and 22 per cent actually lost in rights. This means that from 14 per cent to 42 per

cent of the class failed to benefit at all by the three months' training. With the non-practiced group these percentages are, as we would expect, considerably larger: 17 per cent showed no gain and 15 per cent showed loss in attempts, while $32\frac{1}{2}$ per cent showed no gain and 15 per cent positive loss in rights, i.e., a total of 32 per cent and $47\frac{1}{2}$ per cent of the non-practiced group showed no improvement from three months' school work.

4. The abilities in which no special training was given (in the fundamentals) show improvement, but not nearly so much as in reasoning ability, and show if anything greater improvement in the non-practiced group (really, in this case, the practiced group, for the teacher of Room II emphasized drill in the "fundamentals" to the exclusion of problems). A study, as yet unpublished, of some 55,000 scores by Mr. Courtis has shown a very high correlation between Test 7 and Tests 1, 2, 3, and 4; and accordingly I have used Test 7 to represent the changes in the ability to handle the "fundamentals" or abstract work in arithmetic. Table III and Fig. C show the changes in this test. Here the most striking fact is the large proportion in both groups, even larger in the practiced group, failing to improve after three months' training. The percentages so failing are 41 per cent and 38 per cent for the practiced group, and 34 per cent and 26 per cent for the non-practiced group, in attempts and rights respectively. The conclusion seems to be unavoidable, that in spite of special continued effort and individual attention some pupils, and an alarmingly large number at that, fail to make any improvement. All the results show, however, that the special effort of the teacher has its positively good effect, but the number not reached is certainly too large. We need to work harder at the problem until, as Mr. Courtis has said, "we succeed in giving to each child a year's growth in a year's time." And this, I believe, is possible, if at all, only by far greater attention to individual responses to individual stimuli.

5. Sex differences, for a single test (No. 8), are indicated in Table IV. They seem quite marked but the number of individuals is entirely too small to make the results significant. It is noticeable,

however, that girls seem to respond more readily to special training than boys.

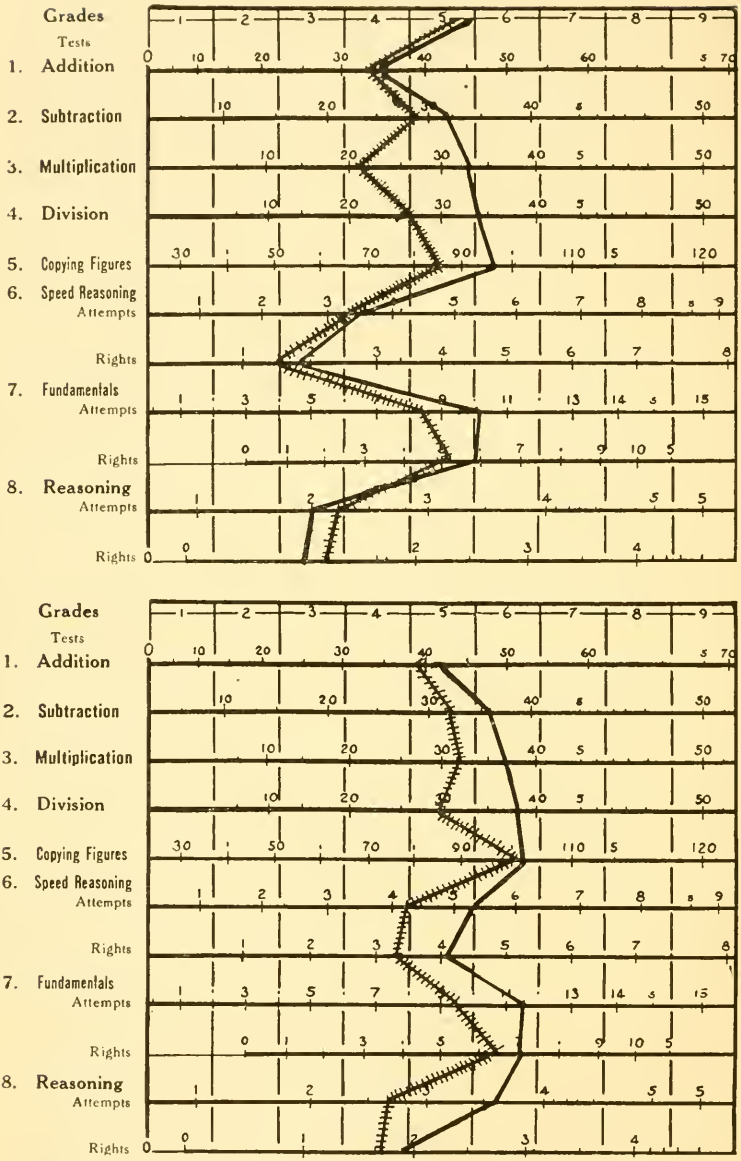
6. Finally, it may be added that the use of the Courtis Tests in this experiment has led to the conclusion that they have a decided value and evident reliability both for purposes of diagnosis and for the measurement of growths. It is to be hoped that similar standard tests may be developed for other school subjects and their use extended. Only thus can we ever hope to develop a scientific basis and safe criteria for measuring the efficiency of teaching methods.

TABLE I

Courtis Tests	Room I. Practiced					Room II. Non-Practiced					Tests
	February Test		May Test		Percentage Gain	February Test		May Test		Percentage Gain	
	Average Score	Percentage Variab.	Average Score	Percentage Variab.		Average Score	Percentage Variab.	Average Score	Percentage Variab.		
No. 1, Add.	35	14	42	14	20	35	17	39	20	11	1
No. 2, Sub.	32	20	36	19	13	29	17	32	22	10	2
No. 3, Mult.	33	19	37	18	11	21	24	32	20	52	3
No. 4, Div.	34	22	38	15	11	26	27	30	30	15	4
Nos. 1–4, Total	132	14	153	13	16	109	17	133	18	22	1–4
No. 5, Copy Figs.	96	13	103	7	7	85	15	102	13	20	5
No. 6 Attempts	3.6	28	5.3	23	47	3.3	23	4.2	21	27	Ats. 6
No. 6 Rights	1.9	38	4.1	25	116	1.6	44	3.3	33	106	Rts. 6
No. 7 Attempts	10.3	17	11.6	18	13	8.4	16	9.4	21	12	Ats. 7
No. 7 Rights	5.9	34	7	36	19	5.1	35	6.4	34	25	Rts. 7
No. 8 Attempts	2	32	3.6	14	80	2.2	36	2.7	37	23	Ats. 8
No. 8 Rights	1	77	1.8	37	80	1.1	61	1.6	50	45	Rts. 8

FIGURE A

ARITHMETIC



COMPARATIVE GRAPHS.—Upper figure, February test; lower figure, May test. Solid line, practiced group, Room I; irregular line, non-practiced group, Room II.

TABLE II

GROWTHS IN REASONING. TEST 8

A. Attempts

Practiced Group	Non-Practiced Group
7% of pupils (3) lost aver. of 53%	22½% of pupils (9) lost aver. of 36%
7% of pupils (3) gained aver. of 0%	20 % of pupils (8) gained aver. of 0%
86% of pupils (35) gained aver. of 112%	57½% of pupils (23) gained aver. of 67%

B. Rights

Practiced Group	Non-Practiced Group
15% of pupils (6) lost aver. of 54%	15 % of pupils (6) lost aver. of 60%
17% of pupils (7) gained aver. of 0%	32½% of pupils (13) gained aver. of 0%
68% of pupils (28) gained aver. of 192%	52½% of pupils (21) gained aver. of 147%

TABLE III

GROWTHS IN FUNDAMENTALS. TEST 7

A. Attempts

Practiced Group	Non-Practiced Group
12% of pupils (5) lost aver. of 23%	13% of pupils (5) lost aver. of 42%
29% of pupils (12) gained aver. of 0%	21% of pupils (8) gained aver. of 0%
59% of pupils (25) gained aver. of 31%	66% of pupils (25) gained aver. of 30%

B. Rights

Practiced Group	Non-Practiced Group
19% of pupils (8) lost aver. of 25%	18% of pupils (7) lost aver. of 40%
19% of pupils (8) gained aver. of 0%	8% of pupils (3) gained aver. of 0%
62% of pupils (26) gained aver. of 35%	74% of pupils (28) gained aver. of 48%

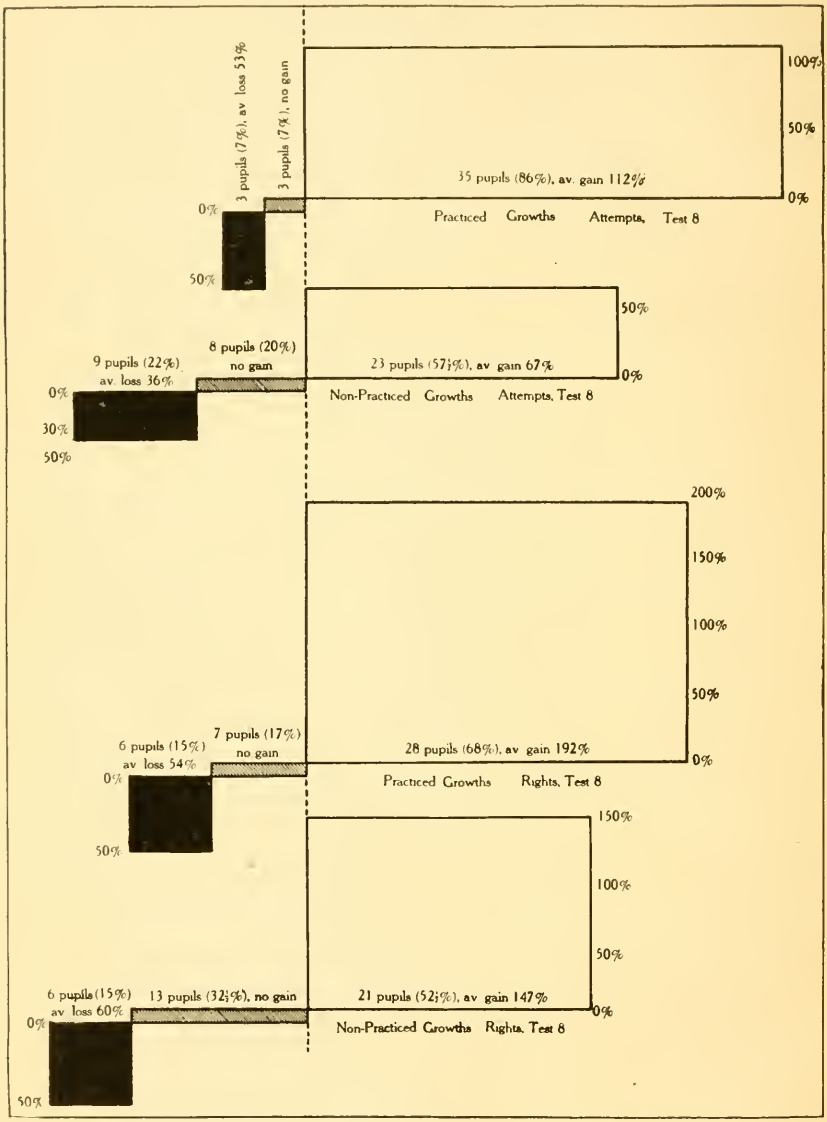
TABLE IV

SEX DIFFERENCES. REASONING. TEST 8

	PRACTICE GROUP							NON-PRACTICED GROUP						
	Average Scores				Average Percentage Gain			Average Scores				Average Percentage Gain		
	Attempts		Rights					Attempts		Rights				
	Feb.	May	Feb.	May	Ats.	Rts.		Feb.	May	Feb.	May	Ats.	Rts.	
14 Boys...	2.1	3.5	1.1	1.6	63	38	18 Boys...	2.1	2.8	1.2	1.8	35	57	
27 Girls...	2.0	3.7	.9	2.0	86	122	23 Girls...	2.3	2.8	1.0	1.5	21	53	

FIGURE B

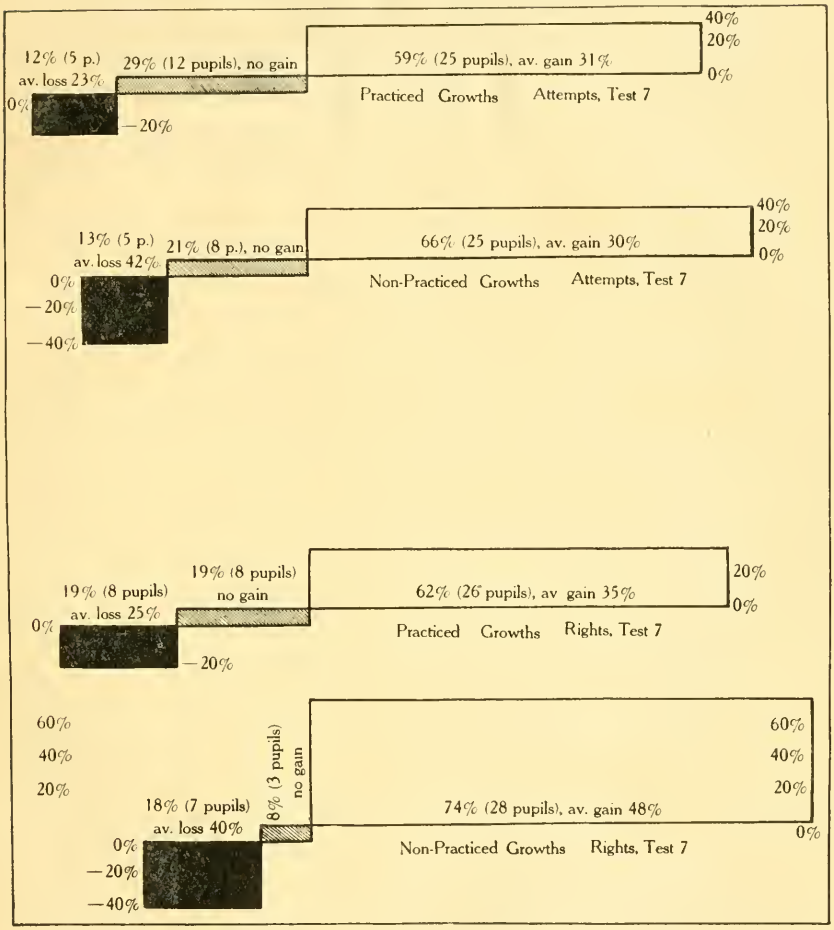
GROWTHS IN REASONING. TEST 8



EXPLANATION: Horizontal distances = number of pupils. Vertical distances = average percentage gain or loss.

FIGURE C

GROWTHS IN FUNDAMENTALS. TEST 7



EXPLANATION: Horizontal distances=number of pupils. Vertical distances=average percentage gain or loss.

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